Teaching Statement

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Good teaching does not only transfer knowledge, it creates intellectual community—after all, university professors are cultivating future colleagues. In an intellectual community, members are self-motivated, feedback facilitates self-improvement rather than division, and information flows freely amongst all members; analogously, good teachers contextualize course material within the students' own interests, use assessment to allow students to monitor their own progress and for the teacher to assess their own teaching, and help students teach and learn from one another rather than acting as a "sage on a stage." As I elaborate in a series of vignettes below, I find that these themes of motivation, feedback, and multi-directional communication recur and co-occur in many of the successes from my years of being a teaching assistant at the university level, as a full-time grade-school teacher in the Peace Corps, and as a volunteer math teacher with the Prison University Project.

Motivating code quality. During my second year as a PhD student at UC Berkeley, I was asked by Prof. Bin Yu to be her teaching assistant for the graduate-level course in applied statistics. Prof. Yu asked me to add a reproducible research component to the course based on my experience at Google, to which end I incorporated Github, code readability, and unit testing into the lab requirements.

I quickly realized that simply lecturing on code readability and making it a component of the grade was insufficient. The students—who were otherwise very highly motivated—simply did not see the importance of readability enough to change bad habits. To address this, I designed an in-class exercise in which the students had to "reproduce" a simple analysis written by me. In my code, I deliberately and systematically violated all the code readability guidelines I was trying to teach. As a result, it was quite difficult to understand what my analysis was doing. To sweeten the pot, I put a small but meaningful error in the code and challenged the students to find it. The students loved the puzzle-solving aspect of the assignment and, to my delight, spent much of the hour complaining about my terrible style. I had motivated the students in a way they understood, and, following this assignment, the labs' code readability improved considerably.

Evaluating in a way that accomodates multiple ability levels. Math teachers often have to accommodate a wide range of student abilities and backgrounds, and my introductory statistics class at San Quentin University through the Prison University Project (PUP) was particularly extreme in this regard. Some students had been at the top of their class when they were younger, while others were very intelligent but had only learned basic arithmetic as adults through PUP. As a consequnce, I needed to design exercises which accommodated this range of abilities and needs without leaving anyone discouraged or bored.

My solution was to reduce the proportion of the class devoted to lectures and increased the time available for individual or group work while I walked around and answered questions. I would design problem sets for such periods with the expectation that *no* student would be able to complete the whole thing in the time allotted. In this way, the faster students could quickly proceed to more challenging problems, while the slower students could spend more time with concepts that were new to them without feeling ashamed of not completing the full exercise set. When I found the same question was being asked repeatedly, I would bring everyone together for a brief lecture on the question, and then return to individual work. By providing evaluation tasks that were non-threatening and matched to students' ability levels, I helped create an inclusive classroom environment, and got a lot of feedback for myself about the effectiveness of my teaching as well.

Frequent and meaningful evaluation. When I was a teaching assistant for the graduate-level applied statistics course, the students came from a wide array of technical backgrounds, from statistics to psychology, and some students were little more than auditing, while some wanted to work hard to push their own boundaries. I expected that some students would struggle with the material, and wanted to provide evaluation that would be useful to all students.

I accomplished this goal in several ways. First, I made the rubric for grading the labs as clear as possible, and allowed for a lab to be successful in many different aspects, including clarity of exposition, quality of graphics, analytical creativity, etc.. Next, I made sure that the students were continually updated with their own progress and on the grade that they were slated receive based on their performance to-date. Finally, I offered to give detailed feedback on how to improve a particular lab if the students were willing to spend time with me in person. With the help of frequent and substantive feedback, some of the students who began with the weakest backgrounds went on to become some of the strongest by the end of the class—and one has even gone on to become a professional data scientist.

Short questions during lecture. Most technical lectures have many points at which minor inferential steps can be made into a short, minute-long exercise. Whenever it is possible to get feedback from the audience, I always build in such mini-exercises, which both requires students to remain actively engaged and reveals if the exposition is going too quickly. In order to allow less vocal students to participate, one can limit the number of questions per class that a given student can answer, or one can call on the third hand to be raised rather than the first.

A particularly fun variant of this idea which I developed during the Peace Corps is the "deliberate mistake". I would warn my seventh-grade math students that I was going to make a mistake in the next five minutes. The students would instantly become on the edge of their seat. In their enthusiasm, they often identified "mistakes" that were not actually mistakes, but every such instance was still a valuable teaching moment. By encouraging communication from the students to myself, I was able to both motivate the students intrinsically and evaluate for myself whether I was teaching effectively.

Two-way communication in statistical consulting. Statistical consulting, though not a classroom setting, is teaching-adjacent venue in which two-way communication is particularly important. I have provided statistical consulting services in many settings, including in the UC Berkeley statistical consulting class, as a fellow in the Berkeley Institute of Data Science, as a private contractor, and, for several years as a member of UC Berkeley's chapter of the National Security Agency Statistical Advising Group (NSASAG). Rarely, I have found, does a petitioner actually ask a useful statistical question at first, and a statistical consultant provides the most value by actively encouraging the petitioner to explain to them the problem motivation, not only its narrow statistical framing.

For example, as part of the NSASAG, we were asked how to compute low-rank approximations of matrices with some given statistical properties. Upon pressing for more information about the motivation, I learned that all that was actually needed was the computation of a t-statistic based on a linear form of a high-dimensional parameter, which I saw could be computed exactly using the conjugate gradient algorithm with no recourse to low-rank approximations. Because I promoted two-way communication rather than simply attempting to convey statistical knowledge, we were able to come to a much better solution that we would have otherwise.

Be the teacher your students want, not the teacher you would want. As a third-year undergraduate, I was asked by my engineering department to be a teaching assistant for the second-year class in statics, which was a required course for most engineering majors. Based on my own intellectual tastes at the time, I spent my weekly lectures re-deriving the course material from a more rigorous mathematical perspective in the form of assumptions and theorems. This being my first teaching role, I violated all of the above rules — I did not seek meaningful feedback from the students, I did not encourage students to work together, and, most importantly, I considered only my own motivation and not theirs. As a consequence, it was not until I received teaching evaluations at the end of the semester that I realized that the students had almost uniformly wanted more intuition from the supplementary lectures, not more rigor. Fortunately, this humbling experience set me on the long and never-ending path towards improving my teaching, leading to the more successful vignettes above.